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reduced. This phenomenon is ascribed to a reduction of sensation for changes of position. The greatly increased threshold value of the stimulus of co-ordinating the action of antagonistic muscles is the closing explanatory suggestion.

Ueber Unterscheidungszeiten. J. v. KRIES. Vierteljahrsschrift f. Wiss. Philos., January, 1887.

According to Wundt, perception is the entrance of a conception into the inner field of vision, and apperception is its entrance into the inner point of vision; and he ascribes a distinct element of a total reaction time to the interval between these two processes. v. Kries doubts the wisdom of thus introducing figurative expressions which are not immediately intelligible into the description of psychic processes, and thinks that this formulation of Wundt runs some risk of overlooking important things and confusing different ones. It inclines uncritical minds to think that each concept, a certain time after it enters the field of mental vision, passes on to the focus of attention, and that thus apperception time of *e. g.* a complex object is always a quite definite time. v. Kries therefore prefers the term differentiation time, first used by him in 1877, because the different qualities of the same object are known in quite different times depending on the direction of attention, etc. In these earlier experiments the task for the experimenter was to give all his attention to determining whether a signal had a certain quality (*e. g.* was red or not), which is quite different from recognizing which of several colors appeared. Again, the so-called *c*-method of Donders requires simply reaction on *a* and not to *b*, and is not to be confounded, as Wundt does, with a choice between motion and rest. v. Kries's experiments involve only mental differentiation, and his results, such as that localization is quicker than judgment of intensity, optic direction than distance, and acoustic localization time increases with decrease of the angle of divergence, are not to be brought under Wundt's rubrics. Wundt's method of reacting after the judgment is made that perception has taken place, introduces an element of introspection which is too variable to give precise results. Differentiation time proper is here at least increased by a value of unknown magnitude, and it is impossible to exclude cases in which the impulse to reaction precedes knowledge. In such a series of psychic processes it is impossible to bring the reaction always at one and the same stage of each series, as much so as it would be to react at either the optic or the acoustic sensation of an electric spark at will. Results by Wundt's method are therefore doubted. Either the reaction is too quick, or else reflection time is added. Of Wundt's pupils, all have found, therefore, too long reaction times, and one of them, Cattell, even intimates that v. Kries not only often reacted prematurely, but often suppressed results, in one series in fact more than half of all. This v. Kries indignantly denies, and repeated his former experiments only to find them correct.

Kritisches und Experimentelles über den Zeitsinn. Von RICHARD GLASS. Philosophische Studien, IV, Heft 3, pp. 423-457.

The fact that in the sphere of the time sense, more than elsewhere, the conclusions of different observers stand in glaring contradiction to one another, induced the author to attempt to add his contribution to the topic. He follows in the footsteps of Estel and

Mehner, and used the same instrument, the essential parts of which consist in a device for marking off the standard time by the interval between two electric clicks, and for measuring the time between the last of these clicks and the stoppage of the apparatus, the latter being the time that the subject regards as equal to the first interval. Vierordt had found that small intervals are over-estimated, large ones under-estimated, an indifference point (where the estimate is correct) intervening. Estel found that at the multiples of the time at which this indifference point occurred there were likewise maxima of accuracy of judgment; he also concluded that Weber's law was not applicable to the time sense. Mehner's results are, that these maxima of accuracy occur only at the odd multiples of the indifference time (.71 sec.), the minima of accuracy occurring at the even multiples, up to about 11.4 sec. Furthermore, that intervals up to .7 sec. were exaggerated; intervals from .7 sec. to 5 sec. were under-estimated, and larger intervals again exaggerated. The author subjects these results to a rigorous criticism, the outcome of which is that a harmony in the results can be brought about only by not working the results for more than they are worth, and by taking into account the method, the unavoidable individual differences, and the rough and unusual sense exercise that is employed.

His own results are as follows: The standard times in the first series were the multiples of .7 (in the main) up to 15 sec.; and 100 observations on each time were made. He finds that points of greatest accuracy are at 2.8, 7.8, 9.3, 12 and 14.2 secs., and of minimum accuracy at 5, 8.5, 10, 12.8 and 15 sec. This does not agree with the periodicity of Mehner, but shows two groups of relative indifference points, each rising by an interval of about 5 sec. (2.8, 7.8, 12), (9.3, 14.2). The result of the second and more extended series is that the difference between the points of greatest accuracy is quite regularly 1.25 sec., with the exception that at .8 sec. there is a point not thus included. The law for the points of least accuracy cannot be traced. If we take into account that all the judgments are too long because they include parts of a reaction time and deduct $\frac{1}{10}$ of a sec. on this score, all the intervals (excepting that at .8) are under-estimated. The general conclusion supports Vierordt and opposes Mehner. Regarding Weber's law the author concludes that while decided deviations from this law occur (some of which can be explained), yet there is a strong tendency to follow the law as closely as the nature of the experiments would lead one to expect.

It will be seen that while this paper forms a real contribution to our knowledge of the time sense, it by no means places this topic in the clear light in which it should stand to gain recognition as a branch of accurate science.

J. J.

Beiträge zur Theorie der sinnlichen Aufmerksamkeit und der activen Apperception. Von N. LANGE. Philos. Studien, Bd. 4, Heft 7.

Attention strengthens sensations, so that even very weak ones may eclipse in consciousness those objectively far stronger. But for this specific power, present sensations would expel concepts, memory, etc., because the former are more intense. Attention, however, is no extraneous power. It is a name for the process of reinforcing one set of impressions by another set. In attention the will does not work directly on concepts. The will must not be divided into motive and